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ABSTRACT

The effectiveness of sign language was compared with verbal language instruction with 12 nonverbal severely retarded students (4 to 9 years old). Ss received either speech training, sign language training, or instruction in an area other than communication. During the second year, 10 Ss received training from their parents. Results indicated no significant differences between the three groups (sign language, speech, and placebo) for the total number of words learned or the linguistic level achieved, nor were there significant correlations among Ss' cognitive level and their learning of either sign language or verbal language skills. The hypothesis that Ss in the sign language condition would learn more words than SS in the speech training condition was statistically rejected, although all four signing condition Ss learned some signs while only two of the speech condition Ss learned to say any words. (CL)

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Final Report of:

A COMPARISON OF MANUAL AND ORAL LANGUAGE TRAINING WITH MUTE RETARDATES

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Introduction

A considerable body of research has been directed toward the development of speech with children who have never exhibited meaningful expressive language (e.g., Bricker & Bricker, 1970; Guess, Rutherford, & Twichell, 1969; Risely, Hart & Doke, 1972; Sailor, Guess, & Baer, 1973; Sherman, 1965; Sloane, Johnson, & Harris, 1968). While these studies, and others, have demonstrated considerable success in developing speech with nonverbal retarded children, they have not been totally effective. Many of the children developed very limited speech or no useful speech. In addition, none of the attempts to develop speech with nonverbal retarded children have been successful in generating generalization so that, after the training has been completed, the children continued to increase their vocabularies and improve their grammatical structure (Sailor, Guess, & Baer, 1973). A possible explanation, for these limitations in training oral communication, is that the children who did not learn much, might not have had the cognitive structures necessary for the acquisition of referential speech (Bates, 1976, Bates, Camaioni, & Volterra, 1975; Bowerman, 1976; Kahn, 1975; Leonard, 1978; Moerk, 1975; Morehead & Morehead, 1974; Sinclair, 1971, 1975).

Because of the lack of successful experience in training many severely and profoundly retarded children to speak, many schools throughout the United States have begun to train their nonverbal clients to use other forms of communication. These methods include Bliss symbols (Vanderheiden, et al., 1975), Non-Slip (Carrier & Peak, 1975), and sign language. Each of these methods would appear to be appropriate with different populations. Bliss symbols require a higher level of cognitive functioning than the other two methods and some receptive vocabulary. They would seem to be most

appropriate for those individuals who are cognitively capable of developing speech but are not physically able to do so. Non-Slip is most appropriate for those individuals who are physically unable to make the movements necessary for sign language and who cannot learn (at least as yet) to speak. Sign language seems to be appropriate with children who are unable to speak or who cannot, as yet, learn to speak, and who have the manual dexterity needed for shaping the signs.

It is believed that sign language is appropriate for children who are at too low a cognitive level to use referential speech for two reasons. First, Piaget (1962) found that in normal infants, the cognitive structures necessary for gestural imitation seem to precede the cognitive structures necessary for the imitation of words. Kahn (Note 1) also found this to be the case with profoundly retarded children. It appears that children functioning as low as stage three or four of Piaget's sensorimotor period use gestures of their own to express themselves while it's not until stage five that they are capable of speech and not until stage six that they are capable of referential speech. Second, Stokoe (1975) cites evidence that hearing children of deaf parents make two-sign, and longer, phrases beginning around 12-14 months, much earlier than most children can use two-word phrases verbally. Stokoe also states that, in families with both deaf and hearing individuals, hearing children will learn to sign before they learn to speak.

Gardner and Gardner (1969) trained a chimp, Washoe, to use sign language with good success. Berger (1972), Hall and Talkington (1970), and others have demonstrated the feasibility of teaching sign language to deaf retarded children. Several recent studies have demonstrated that it is possible to teach signs to nonverbal retarded children (Bricker, 1972; Kopchick, Romback, & Smilovitz, 1975; Linville, 1977; Richardson, 1975; Topper, 1975;

Vanbiervliet, 1977). However, none of these studies have investigated the relative efficacy of verbal language training and sign language training. The present study is such an attempt to determine if sign language training is a more effective method of teaching nonverbal retarded children to communicate than verbal language training. This study also attempted to determine in the last two years of its three year length, if parents could be effective verbal or sign language teachers of their own children.

The hypotheses of this study were:

1. The children in the sign language condition will learn more words (in sign language) than the children in the speech training condition;

2. Each of the groups receiving language training will learn more words or signs than the placebo group;

3. The children in the sign language group will begin to use speech in addition to, or in place of, signs; and

4. Parents will be able to train their own children as well as the trained graduate assistants if given adequate training and supervision.

Method

Subjects

The subjects who received training from graduate research assistants consisted of 15 nonverbal, hearing, retarded children. Originally, there were 12 subjects, six at a private residential facility for the retarded and six who were living at home and attending a private day care school. However, by the end of 10 months training three of the subjects had

dropped out and were replaced. The chronological ages of the children at the beginning of training ranged from 53 to 101 months with the $\bar{X}$ = 69 months. None of the subjects had any audiological or motor disabilities that would prevent the learning of speech or sign language. In addition, none of the subjects were receiving individual language training (speech or sign language) from their schools.

The subjects who received training from their parents consisted of 17 nonverbal, hearing retarded children. The subjects were all living at home and attending one of three private day care schools. None of the subjects were receiving individual language training at their schools. Due to a high rate of mortality, only nine of these subjects participated for over six months (See Table 4 for the time each of these subjects participated). The chronological ages of these nine subjects at the beginning of training ranged from 49 to 109 months with the $\bar{X}$ = 76 months.

Procedure

At the beginning of the study (September, 1975), 12 subjects were selected, six each from two sites, to receive training from graduate research assistants. The subjects were matched in threes (matching was used due to the small number of subjects) according to age, sex, etiology, and stage of sensorimotor period functioning and then were randomly assigned to one of three training groups. Etiology was determined using medical, psychological, and personal histories and classifications were made according to the major medical categories outlined by Grossman, et al. (1973). The stage of sensorimotor period functioning was determined by using the Uzgiris and Hunt (1975) scales. These scales have been shown to be reliable and valid

with severely and profoundly retarded children (Kahn, 1976). However, severely retarded children do not progress at the same rate through each of the seven scales of this assessment device. Therefore, for this study, the subject's sensorimotor period score was considered to be the highest stage he/she evidenced on any of the seven scales.

Within the first 10 months three of the subjects dropped out and were replaced by three new subjects who were matched, on the above criteria, with the subjects they were replacing. Data are only given on the 12 subjects who continued to participate in the study beyond this point. One other subject did not continue in the study for the remaining 23 months. His total time of participation was 30 months out of a possible 33 months. The amount of time each subject participated, along with their stages of sensorimotor period functioning, and their progress in the language training program are given in Table 3 in the Results section of this paper.

Each of the subjects received individual instruction, for 20 minutes a day five days a week. Some time was missed for vacations and sickness but each subject received approximately the same number of training sessions. The three training groups consisted of a group receiving speech training using the program developed by Bricker, Dennison, and Bricker (1976), a group receiving training in sign language using a program adapted from the Bricker, et al. program (this was done in order to keep the two language training programs as similar as possible), and a placebo group receiving instruction in an area other than communication.

The Bricker, et al., (1976) program consists of 26 phases of training beginning with sitting and ending with the production of three-word phrases.

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insert Table 1 about here

The program includes 14 prelingual phases of training (sitting, eye control, working on a task, eight phases of imitation training, two phases of functionally using objects, and an early work recognition phase) and 12 phases of training speech (imitation, comprehension, and production of nouns, verbs, two-word phrases, and three-word phrases, respectively). These are the phases of training being followed for the verbal communication group.

The Bricker, et al. (1976) program has been adapted for the manual communication group. In essence the changes in the original program consist of eliminating the five phases of training dealing with imitation of sounds and by requiring imitation, comprehension, and production of signs rather than verbalization.

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insert Table 2 about here

The manual communication training includes presentations of the verbalization, as in total communication, each time a sign is produced. However, contrary to total communication, attempts are made to elicit only the signs and not the verbalizations from the children in this training condition.

The third group (placebo) received training in areas other than communication. In the almost three years of the project the areas on which each of these subjects received training varied. Areas of training included self-care skills, play therapy, and motor skills.

Since imitation and behavior control techniques are used in these training procedures, some improvements in these areas are expected. While these

four subjects are spoken to during this training, no attempt is being made to have them communicate with the trainers.

Each of two trainers works with two children from each of the three groups. This is done to eliminate trainer ability and performance as confounding factors. Training is carried out for 20 to 30 minutes a day, five days a week. Assessment was accomplished through the use of baseline like probes every two weeks.

At the beginning of the second year of the project a new group of subjects was added. These 10 children were to receive training (five in sign language and five in speech) from their parents. Unfortunately, due to a large dropout rate, we went through a total of 17 subjects in order to have nine children who received training for at least six months. Data are only reported on these nine subjects. The parents were trained in either the Bricker, Dennison, and Bricker (1976) program (for the children in the speech training group) or the sign language adaptation of this program (for the children in the sign language group). A graduate research assistant visited the parents at home at least once every two weeks and for data collection purposes.

Results

The phases of training which each child began at, and had achieved the criterion for, at the end of the training period are given in Table 3. All of the names used in this paper are pseudonyms in order to keep the identity of the subjects and their families confidential. It should be remembered that there are 26 phases of verbal language training (Table 1) and only 21

Insert Table 3 about here

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phases of sign language training (Table 2). Therefore, phases 15 to 26 of verbal language training are equivalent to phases 10 to 21 of sign language training in linguistic complexity. A plus (+) after the phase of training at which the child was functioning at the conclusion of training indicates that the child had progressed beyond that phase but had not achieved criterion on the subsequent phase. Thus, Len had learned to sign two four-sign phrases in addition to having achieved the criterion for phase 21. All together Len learned to initiate, comprehend and produce 45 single signs, 45 two-sign phrases, and 14 three-sign phrases in addition to the two four-sign phrases. Len also had demonstrated increased vocalization and says three words with, or instead of, the signs.

Jim learned to imitate, comprehend, and produce 74 single signs, 19 two-sign phrases, and four three-sign phrases. In addition, he says four words with, or instead of, the signs. The other two signing subjects have been in the program for less time having replaced two of the children lost to the project. One of these children, Tom, imitates, comprehends, and produces 32 single signs, imitates and comprehends 37 two-sign phrases, and independently produces five two-sign phrases. Cathy, the last signing group child, imitates, comprehends, and produces eight single sign and one two-sign phrase.

In the verbal training group, Joel imitates, comprehends and produces 90 words, 33 two-word phrases, nine three-word phrases, and four four-word phrases. Grace imitates and comprehends five words and independently produces three words. Art comprehends five words but says none either in imitation or independently. Dave is still working on the imitation of familiar sounds, not having gotten to the linguistic portion of the program.

None of the placebo children achieved any of the linguistic phases (phases 15 to 26 on the verbal program) of the training program. Gloria and Brenda each demonstrated criterion on phase 13, the appropriate use of objects. However, they had not fully achieved criteria on phase 10. George was still not imitating familiar sounds while Mark was working on task but was not initiating any gestures or sounds.

A priori t tests (Kirk, 1968) were used to compare each of the trained groups (verbal and sign language) with the placebo group. The sign language group learned significantly more signs than the placebo group learned words or signs ($t=2.891$, $df=6$, $p < .05$). There was no significant difference between the verbal training group and the placebo group. Analyses of variance revealed no significant differences between the three groups for the total number of words learned or the linguistic level achieved (as measured by the highest phase of training accomplished, adjusted for the different number of phases in the two programs). In addition, there were no statistically significant correlations (which ranged from .52 to .56) among the subjects' cognitive level and their learning of either sign language or verbal language skills.

The children who were trained by their parents showed only slight progress. The phases of training which each child began at, and had achieved the criterion for, at the end of training are given in Table 4. It should again be remembered that there are 26 phases of verbal language training and only 21 phases of sign language training. A plus (+) after the phase of

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Insert Table 4 about here

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training at which the child was functioning at the conclusion of training indicates that the child had progressed beyond that phase but had not achieved criterion on the subsequent phase. Thus Fran has learned to imitate, comprehend and produce three two-word phrases and nine three-word phrases in addition to seven single words. Marge comprehends 12 spoken words and says eight words independently. Mary, Rich, and Peggy did not learn to imitate, comprehend, or produce any words though they all did progress to higher phases of training.

Three of the four signing subjects did learn to use some signs. Jenny learned to imitate, comprehend, and produce 12 single-signs and 3 two-sign phrases. Sue learned to imitate and comprehend eight signs and to produce six signs. Ralph learned to imitate and comprehend 3 signs but did not produce any signs independently. Alfred did not learn to imitate, comprehend, or produce any signs.

DISCUSSION

The fact that there was only one comparison (between the signing group and the placebo group) that was found to be statistically significant is not surprising. As stated in the original proposal for this research, with such a small number of subjects it would take very large differences to find statistical significance. Two of the hypotheses were tested statistically. The first hypothesis, that the children in the sign language condition will learn more words (in sign language) than the children in the speech training condition, was statistically rejected. However, when the data are carefully reviewed it can be seen that all four of the signing condition subjects learned some signs (74, 45, 32, and 8 respectively) while only two of the speech

condition subjects learned to say any words (90 and 3, respectively). Thus, the training procedure for signing was reasonably effective while the results of the verbal training procedure were mixed. The reason there was no statistical differences between the signing group and the verbal group (a t test was performed to verify this after the ANOVA was found to be nonsignificant) may be due to one verbal child learning so many words (90), the large variance of the verbal group ($S = 44.52$), and the very small number of subjects.

The other statistically tested hypothesis, that the language trained groups would learn more words or signs than the placebo group, was partially supported and partially rejected. The signing group did learn statistically more signs than the placebo group learned signs or words but there was no statistical difference between the verbal group and the placebo group. This lack of significance may again be explained by the large variance of the verbal group.

The other two hypotheses were not tested statistically. The third hypothesis, that the children in the sign language group would begin to use speech in addition to, or in place of, signs, was somewhat supported. Two of the four children receiving sign language training did begin to say a few words each. While this is not a major (in terms of numbers) generalization from signs to speech, it is an extremely important finding. Some theorists, in particular those who insist upon the importance of cerebral dominance, state that this transfer (from signs to speech) will not occur, and that the learning of signs may even hinder the eventual learning of speech. However, this finding of even a small amount of transfer indicates that, as used in this

study, sign language is not a hindrance to speech. In fact, the learning of sign language may be helpful to the mentally retarded child who is having difficulty learning to speak.

The fourth hypothesis, that parents could be successful language trainers of their own children if given adequate training and supervision, was not supported. While all of the children in this condition did advance somewhat, on the whole, their improvement was rather small. While it may be that there was not enough training and supervision, it would appear that a staff member would be a more effectively used in direct training of children. That is, more children will learn more from a well trained teacher than from parents being supervised by that teacher. While the data are not conclusive in this regard, they certainly point in this direction.

The results of this study are far from conclusive and must be viewed cautiously anyway because of the small number of subjects. However, there are some positive statements that can be made with this caution understood. First, the training procedures for signing have been reasonably successful while the verbal training procedures had mixed results. Second, it appears that some transfer, from manual signs to verbalizations, can occur if the verbalizations are paired with the sign during training. In general, the teaching of sign language appears to be a useful procedure for some children, particularly those below stage six of the sensorimotor period. However, a good deal more research is needed in order to determine which children will benefit most from either a signing or speech training program. Further research is also needed to investigate ways in which the transfer of signing to speech may be enhanced.

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Table 1

Phases of Language Training (Verbal)[a]

Phase 1: Sit in Chair

Phase 2: Eye Contact

Phase 3: Work on Task

Phase 4: Increase Vocalization

Phase 5: Early Gestural Imitation

Phase 6: Gestural Imitation of Familiar Actions

Phase 7: Gestural Imitation of Unfamiliar Actions

Phase 8: Sound Imitation - Child Initiated

Phase 9: Sound Imitation of Familiar Sounds

Phase 10: Sound Imitation of Unfamiliar Sounds

Phase 11: Early Word Recognition

Phase 12: Functional Use of Objects

Phase 13: Appropriate Use of Objects

Phase 14: Verbal Imitation of Component Sounds

Phase 15: Imitation of Nouns (Criterion = 5 words)

Phase 16: Comprehension of Nouns (Criterion = 5 words)

Phase 17: Production of Nouns (Criterion = 5 words)

Phase 18: Imitation of Verbs (Criterion = 5 words)

Phase 19: Comprehension of Verbs (Criterion = 5 words)

Phase 20: Production of Verbs (Criterion = 5 words)

Phase 21: Imitation of 2-word Phrases (Criterion = 10 phrases)

Phase 22: Comprehension of 2-word Phrases (Criterion = 10 phrases)

Phase 23: Production of 2-word Phrases (Criterion = 10 phrases)

Phase 24: Imitation of 3-word Phrases (Criterion = 10 phrases)

Phase 25: Comprehension of 3-word Phrases (Criterion = 10 phrases)

Phase 26: Production of 3-word Phrases (Criterion = 10 phrases)

[a] Adapted from Bricker, Dennison, & Bricker, 1976.

Table 2

Phases of Language Training (Sign)[a]

Phase 1: Sit in Chair

Phase 2: Eye Contact

Phase 3: Work on Task

Phase 4: Early Gestural Imitation

Phase 5: Gestural Imitation of Familiar Actions

Phase 6: Gestural Imitation of Unfamiliar Actions

Phase 7: Eariy Word Recognition

Phase 8: Functional Use of Objects

Phase 9: Appropriate Use of Objects

Phase 10: Imitation of Signs for Nouns (Criterion = 5 signs)

Phase 11: Comprehension of Signs for Nouns (Criterion = 5 signs)

Phase 12: Production of Signs for Nouns (Criterion = 5 signs)

Phase 13: Imitation of Signs for Verbs (Criterion = 5 signs)

Phase 14: Comprehension of Signs for Verbs (Criterion = 5 signs)

Phase 15: Production of Signs for Verbs (Criterion = 5 signs)

Phase 16: Imitation of Signs for 2-word Phrases (Criterion = 10 combinations of signs)

Phase 17: Comprehension of Signs for 2-word Phrases (Criterion = 10 combinations of signs)

Phase 18: Production of Signs for 2-word Phrases (Criterion = 10 combinations of signs)

Phase 19: Imitation of Signs for 3-word Phrases (Criterion = 10 combinations of signs)

Phase 20: Comprehension of Signs for 3-word Phrases (Criterion = 10 combinations of signs)

Phase 21: Production of Signs for 3-word Phrases (Criterion = 10 combinations of signs)

[a] Adapted from Bricker, Dennison, & Bricker, 1976.

Table 3

Length of Training, Cognitive Level, Beginning Phase, and Final Phase for Each Graduate Assistant Trained Subject

Subject	Type of Training	Length of Training	Sensorimotor Stage	Beginning Phase	Final Phase
Len[a]	Sign	33 mos.	6	2	21+
Jim	Sign	33 mos.	5	2	18+
Tom	Sign	27 mos.	6	3	17+
Cathy	Sign	21 mos.	5	3	12+
Joel	Verbal	33 mos.	6	2	23+
Grace	Verbal	33 mos.	5	2	16+
Art	Verbal	30 mos.	6	2	16
Dave	Verbal	30 mos.	6	2	16
Gloria	Placebo	33 mos.	5	3	13
Brenda	Placebo	33 mos.	5	3	13
George	Placebo	33 mos.	5	1	8
Mark	Placebo	33 mos.	6	2	3

[a]The names used are pseudonyms to preserve the anonymity of the subjects and their families.

Table 4

Length of Training, Beginning Phase, and Final Phase for Each Parent Trained Subject

Subjects	Type of Training	Beginning Phase	Final Phase
Ralph[a]	Sign	2	9+
Alfred	Sign	2	9
Jenny	Sign	7	15+
Sue	Sign	5	12+
Fran	Verbal	12	15+
Marge	Verbal	10	15+
Mary	Verbal	2	4
Rich	Verbal	9	12
Peggy	Verbal	8	12

[a]The names used are pseudonyms to preserve the anonymity of the subjects and their families.